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INTERNATIONAL STANDARD ISO 10303-105: 1996
TECHNICAL CORRIGENDUM 2

***Industrial automation systems and integration-
Product data representation and exchange -
Part 105:
Application resource:
Kinematics***

TECHNICAL CORRIGENDUM 2

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Introduction

This document corrects ISO 10303-105:1996, Product data representation and exchange - Part 105: Application resource: Kinematics. The corrected document supersedes ISO 10303-105: 1996 as amended by ISO 10303-105-105:1996/Cor. 1:2000.

The purpose of the modifications to the text of ISO 10303-105: 1996 is to correct errors in the EXPRESS definitions likely to cause compilation problems, to replace the URL in the annex for the computer-interpretable EXPRESS, and to replace the object identifier for the document and the modified schema.

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Modifications to the text of ISO 10303-105: 1996

Clause 5., p. 6

The EXPRESS specification for the *kinematic_structure_schema* contained logical errors in the reference from for the *geometry_schama*. Remove the following:

```
REFERENCE FROM geometry_schema
  (axis2_placement_3d,
   cartesian_transformation_operator_3d,
   curve,
   direction,
   geometric_representation_context,
   normalise,
   point,
   point_on_curve,
   point_on_surface,
   surface,
   rectangular_trimmed_surface,
   trimmed_curve);
```

Replace with the following:

```
REFERENCE FROM geometry_schema
  (axis2_placement_3d,
   cartesian_transformation_operator_3d,
   curve,
   direction,
   geometric_representation_context,
   geometric_representation_item,
   normalise,
   point,
   point_on_curve,
   point_on_surface,
   surface,
   rectangular_trimmed_surface,
   trimmed_curve);
```

Clause 5.4.6, p. 17

The EXPRESS specification for *mechaism_base_placement* had an additional group qualifier for WR3: that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```
*)
ENTITY mechanism_base_placement
  SUBTYPE OF (representation_relationship_with_transformation);
  base_of_mechanism : mechanism;
  SELF\representation_relationship_with_transformation.
  transformation_operator : cartesian_transformation_operator_3d;
DERIVE
  SELF\representation_relationship.rep_2
    : kinematic_link_representation
    := representation_of_link (base_of_mechanism.base);
UNIQUE
  UR1: base_of_mechanism;
WHERE
  WR1: ('KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_GROUND_REPRESENTATION' IN
```

```

        TYPEOF (SELF\representation_relationship.rep_1))
OR
( 'KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_LINK REPRESENTATION' IN
  TYPEOF (SELF\representation_relationship.rep_1));
WR2: suitably_based_mechanism (SELF, base_of_mechanism);
WR3: SELF\representation_relationship_with_transformation.
      transformation_operator IN
      SELF\representation_relationship.rep_1.items;
END_ENTITY;
(*

```

Clause 5.4.12, p. 21

The EXPRESS specification for the *kinematic_link_representation* had an additional group qualifier for the *link_frame* attribute that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY kinematic_link_representation
  SUBTYPE OF (representation);
  SELF\representation.context_of_items :
    geometric_representation_context;
DERIVE
  link_frame : geometric_representation_context
  := SELF\representation.context_of_items;
INVERSE
  link_representation_relation :
    kinematic_link_representation_relation FOR geometric_aspects;
WHERE
  WR1: SIZEOF (QUERY (item <* SELF\representation.items |
    NOT (( 'KINEMATIC_STRUCTURE_SCHEMA.RIGID_PLACEMENT' IN
      TYPEOF (item)))
    OR
    ( 'GEOMETRY_SCHEMA.CARTESIAN_TRANSFORMATION_OPERATOR_3D' IN
      TYPEOF (item)))) ) = 0;
END_ENTITY;
(*

```

Clause 5.4.16, p. 24

The EXPRESS specification for the *kinematic_frame_background_representation_association* had an additional group qualifier for **WR3**: that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY kinematic_frame_background_representation_association
  SUBTYPE OF (representation_relationship_with_transformation);
  SELF\representation_relationship_with_transformation.
    transformation_operator : kinematic_frame_based_transformation;
WHERE
  WR1: 'KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_LINK REPRESENTATION' IN
    TYPEOF (SELF\representation_relationship.rep_1);
  WR2:
    'KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_FRAME BACKGROUND REPRESENTATION'
    IN TYPEOF (SELF\representation_relationship.rep_2);
  WR3: SELF\representation_relationship_with_transformation.

```

```

transformation_operator\kinematic_frame_based_transformation.
    transformator IN
        SELF\representation_relationship.rep_1.items;
END_ENTITY;
(*

```

Clause 5.4.37, p. 42

The EXPRESS specification for the *universal_pair* had an additional group qualifier for **WR1**: that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY universal_pair
    SUBTYPE OF (kinematic_pair);
    input_skew_angle : OPTIONAL plane_angle_measure;
DERIVE
    skew_angle : plane_angle_measure := NVL (input_skew_angle, 0.0);
WHERE
    WR1: COS (plane_angle_for_pair_in_radian (SELF, skew_angle))
        > 0.0;
END_ENTITY;
(*

```

Clause 5.4.68, p. 79

The EXPRESS specification for the *rack_and_pinion_pair_value* had an additional group qualifier for the *actual_rotation* attribute that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY rack_and_pinion_pair_value
    SUBTYPE OF (pair_value);
    SELF\pair_value.applies_to_pair : rack_and_pinion_pair;
    actual_displacement : length_measure;
DERIVE
    actual_rotation : plane_angle_measure
        := convert_plane_angle_for_pair_from_radian
            (SELF\pair_value.applies_to_pair,
             (- actual_displacement /
              SELF\pair_value.applies_to_pair\
              rack_and_pinion_pair.pinion_radius));
END_ENTITY;
(*

```

Clause 5.5.3, p. 82

The EXPRESS specification for the *suitably_based_mechanism* had an additional group qualifier for the *klrep* and the *kgrep* variables that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
FUNCTION suitably_based_mechanism (mbp : mechanism_base_placement;
                                    mech : mechanism) : BOOLEAN;
LOCAL
    kprop : kinematic_property_definition;

```

```

kgrep  : kinematic_ground_representation;
klrep  : kinematic_link_representation;
klnk   : kinematic_link;
kjnts  : BAG OF kinematic_joint;
nmechs : BAG OF mechanism;
nmbps  : BAG OF mechanism_base_placement;
END_LOCAL;

kprop := mech.containing_property;

IF ('KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_GROUND_REPRESENTATION' IN
    TYPEOF (mbp\representation_relationship.rep_1)) THEN
    kgrep := mbp\representation_relationship.rep_1;

    IF (kgrep.property\property_definition_representation.definition
        ::= kprop) THEN
        RETURN (TRUE);
    ELSE
        RETURN (FALSE);
    END_IF;
ELSE
    klrep := mbp\representation_relationship.rep_1;
    klnk   := klrep.link_representation_relation.topological_aspects;
    kjnts  := USEDIN (klnk,
                      'KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_JOINT.FIRST_LINK') +
              USEDIN (klnk,
                      'KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_JOINT.SECOND_LINK');
    nmechs := USEDIN (kjnts[1].structure,
                      'KINEMATIC_STRUCTURE_SCHEMA.MECHANISM.STRUCTURE_DEFINITION');

    IF (nmechs[1] ::= mech) THEN
        RETURN (FALSE);
    ELSE
        IF (nmechs[1].containing_property :<>: kprop) THEN
            RETURN (FALSE);
        ELSE
            nmbps := USEDIN (nmechs[1], 'KINEMATIC_STRUCTURE_SCHEMA.' +
                              'MECHANISM_BASE_PLACEMENT.BASE_OF_MECHANISM');

            IF (SIZEOF (nmbps) = 0) THEN
                RETURN (FALSE);
            ELSE
                RETURN (suitably_based_mechanism (nmbps[1], mech));
            END_IF;
        END_IF;
    END_IF;
END_FUNCTION;
(*

```

Clause 5.5.6, p. 90

The EXPRESS specification for the frame_associated_to_background had an additional group qualifier for the ass_bag and trm_bag variables that is not allowed in the FUNCTION REPEAT and an additional group qualifier in the definition of the rep_bag variable within the FUNCTION. The ass_bag variable constructor did not ensure that the REPRESENTATION_RELATIONSHIP was of type KINEMATIC_FRAME_BACKGROUND_REPRESENTATION_ASSOCIATION. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
FUNCTION frame_associated_to_background
  (frame      : rigid_placement;
   background : kinematic_frame_background) : BOOLEAN;
LOCAL
  rep_bag : BAG OF kinematic_frame_background_representation;
  trf_bag : BAG OF kinematic_frame_based_transformation;
  trm_bag : BAG OF kinematic_frame_based_transformation;
  ass_bag : BAG OF
    kinematic_frame_background_representation_association;
  rep      : kinematic_frame_background_representation;
  ass      : kinematic_frame_background_representation_association;
END_LOCAL;

rep_bag := USEDIN (background,
  'KINEMATIC_STRUCTURE_SCHEMA.' +
  'REPRESENTATION.ITEMS');

IF SIZEOF (rep_bag) = 0 THEN
  RETURN (FALSE);
END_IF;

trf_bag := USEDIN (frame,
  'KINEMATIC_STRUCTURE_SCHEMA.' +
  'KINEMATIC_FRAME_BASED_TRANSFORMATION.' +
  'TRANSFORMATOR');

IF SIZEOF (trf_bag) = 0 THEN
  RETURN (FALSE);
END_IF;

REPEAT i := 1 TO HIINDEX (rep_bag);
  rep := rep_bag[i];

ass_bag := QUERY ( kfbra <* USEDIN ( rep,
  'KINEMATIC_STRUCTURE_SCHEMA.' +
  'REPRESENTATION_RELATIONSHIP.REP_2') |
  'KINEMATIC_STRUCTURE_SCHEMA.' +
  'KINEMATIC_FRAME_BACKGROUND_REPRESENTATION_ASSOCIATION'
  IN TYPEOF ( kfbra ) );

IF SIZEOF (ass_bag) > 0 THEN
  REPEAT j:= 1 TO HIINDEX (ass_bag);
    ass := ass_bag[j];

    trm_bag := QUERY (trm <* trf_bag |
      (trm ::=
        ass\representation_relationship_with_transformation.
        transformation_operator));

    IF SIZEOF (trm_bag) > 0 THEN
      RETURN (TRUE);
    END_IF;

    END_REPEAT;
  END_IF;
END_REPEAT;

```

```

    RETURN (FALSE);

END_FUNCTION;
(*

```

Clause 7.4.3, p. 115

The EXPRESS specification for the founded_kinematic_path had an additional group qualifier for the founding attribute that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY founded_kinematic_path
  SUBTYPE OF (representation);
  SELF\representation.items : SET [1 : ?] OF kinematic_path;
  SELF\representation.context_of_items :
    geometric_representation_context;
DERIVE
  paths : SET [1 : ?] OF kinematic_path := SELF\representation.items;
  founding : geometric_representation_context
    := SELF\representation.context_of_items;
END_ENTITY;
(*

```

Clause 7.4.4, p. 116

The EXPRESS specification for the motion_link_relationship had an additional group qualifier for the motion attribute that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY motion_link_relationship
  SUPERTYPE OF (ONEOF (prescribed_path, resulting_path))
  SUBTYPE OF (representation_relationship);
  SELF\representation_relationship.rep_1 : founded_kinematic_path;
  SELF\representation_relationship.rep_2 :
    kinematic_link_representation;
    related_frame : rigid_placement;
DERIVE
  motion : founded_kinematic_path
    := SELF\representation_relationship.rep_1;
  frame_link : kinematic_link_representation
    := SELF\representation_relationship.rep_2;
WHERE
  WR1: related_frame IN frame_link\representation.items;
END_ENTITY;
(*

```

Annex B.1, p. 123

With the changes identified in this Technical Corrigendum, the object identifier for this part of ISO 10303 has changed. Remove the object identifier for the document and replace with the following:

{ iso standard 10303 part (105) version (3) }

Annex B.2.1, p. 123

With the changes identified in this Technical Corrigendum, the object identifier for the kinematic_structure_schema has changed. Remove the object identifier for kinematic_structure_schema and replace with the following:

{ iso standard 10303 part (105) version (3) object (1) kinematic-structure-schema (1) }

Annex B.2.3, p. 123

With the changes identified in this Technical Corrigendum, the object identifier for the kinematic_analysis_control_and_result_schema has changed. Remove the object identifier for kinematic_analysis_control_and_result_schema and replace with the following:

{ iso standard 10303 part (105) version (3) object (1)
kinematic-analysis-control-and-result-schema (3) }

Annex C, p. 124

With the changes identified in this Technical Corrigendum, the EXPRESS contained in digital form is incorrect. Remove the following:

EXPRESS: <http://www.mel.nist.gov/step/part105/is/tc1/>

Replace with the following:

EXPRESS: <http://www.mel.nist.gov/step/part105/is/tc2/>